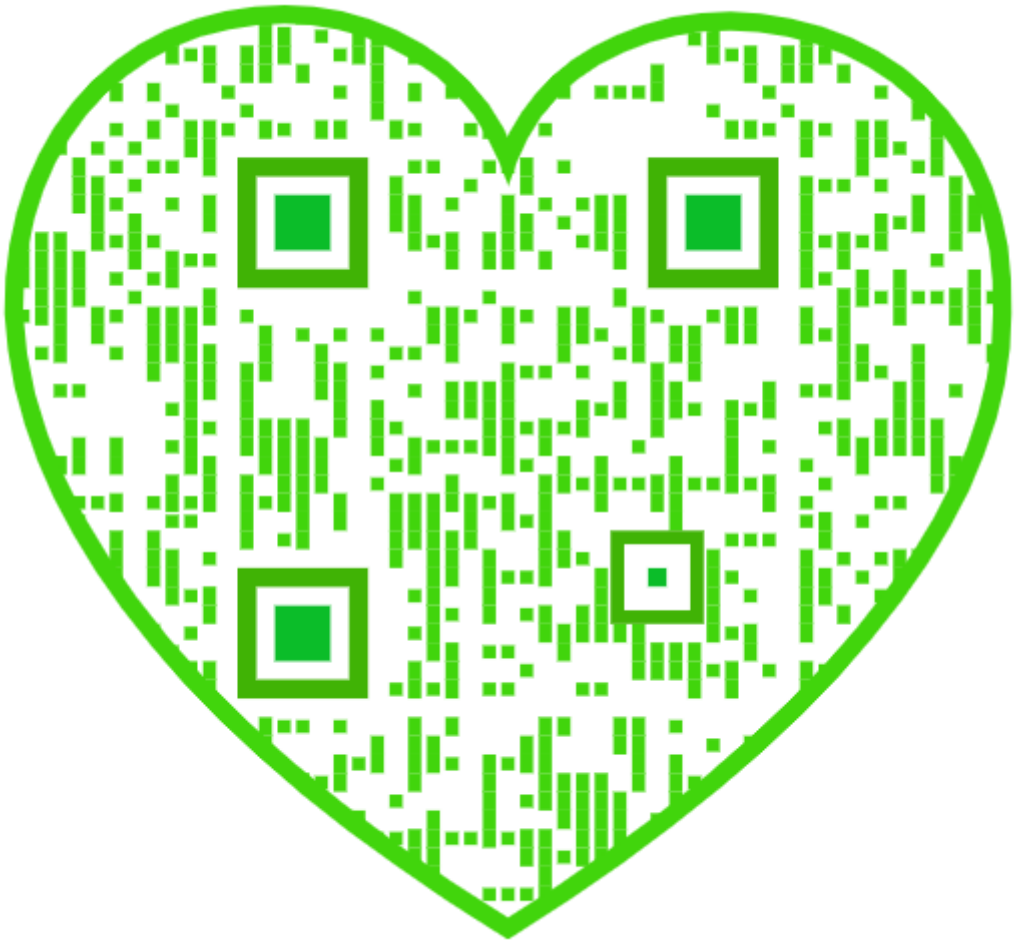
Master in Artificial Intelligence

Algorithm Selection & Development II



Purpose

The purpose of the section is to help you learn how to research, select, and develop appropriate algorithms to become a Successful Artificial Intelligence (AI) Engineer

At the end of this lecture, you will learn the following

- **How to research, select, and develop appropriate machine learning algorithms or deep learning architectures based on the problem at hand and the available data?**

How to determine type of output and evaluation metrices?

Understand the problem

- Domain
- Objectives
- Constraints

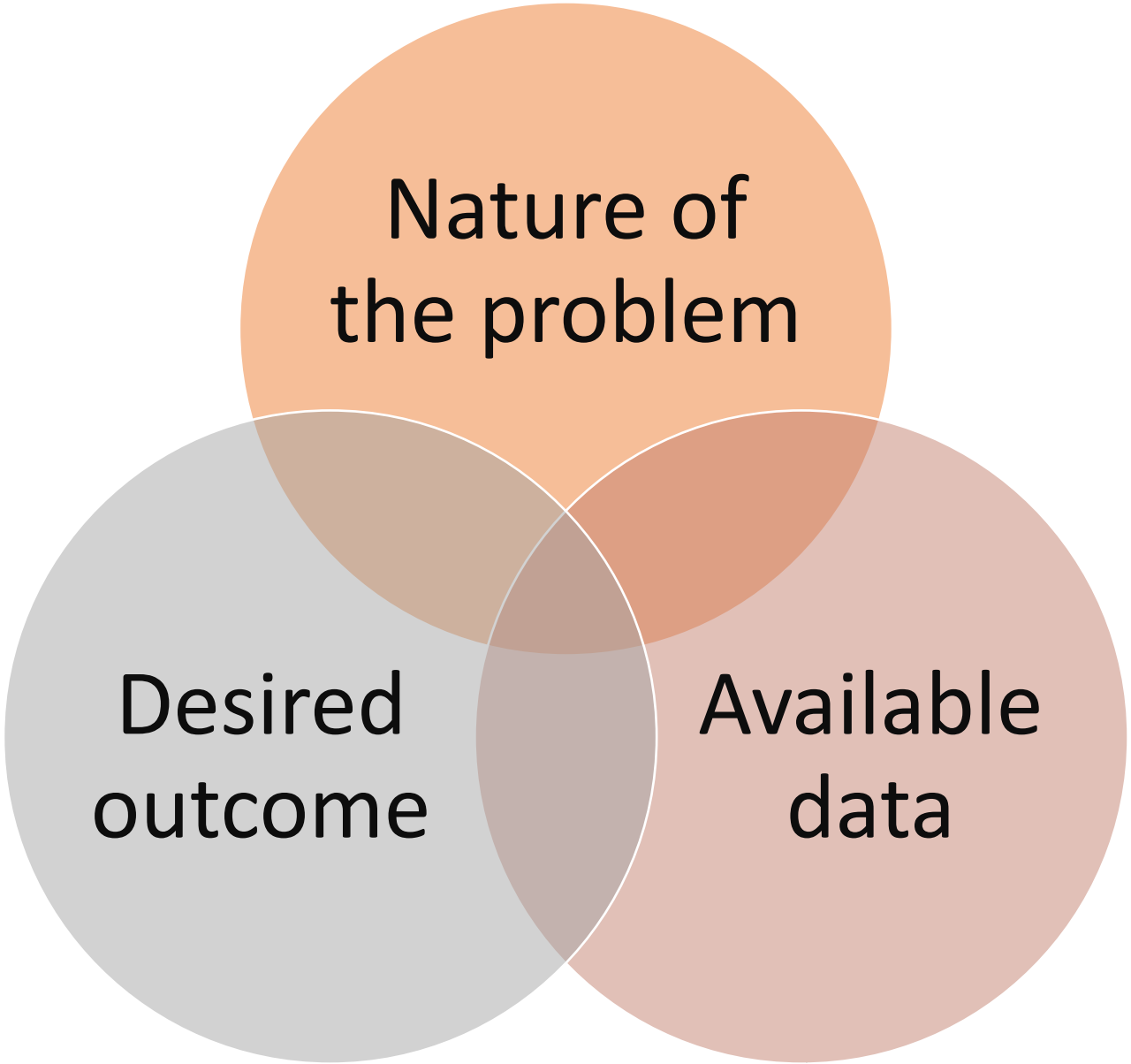
Define the problem as a

- Supervised
- Unsupervised
- Reinforcement learning task

Determine

- type of output (e.g., classification, regression, clustering)
- Evaluation metrics

How to determine type of output and evaluation metrices?



Classification

Involve

Predicting discrete class labels or categories	Input data

Examples

Spam detection	Sentiment analysis	Image classification

To determine

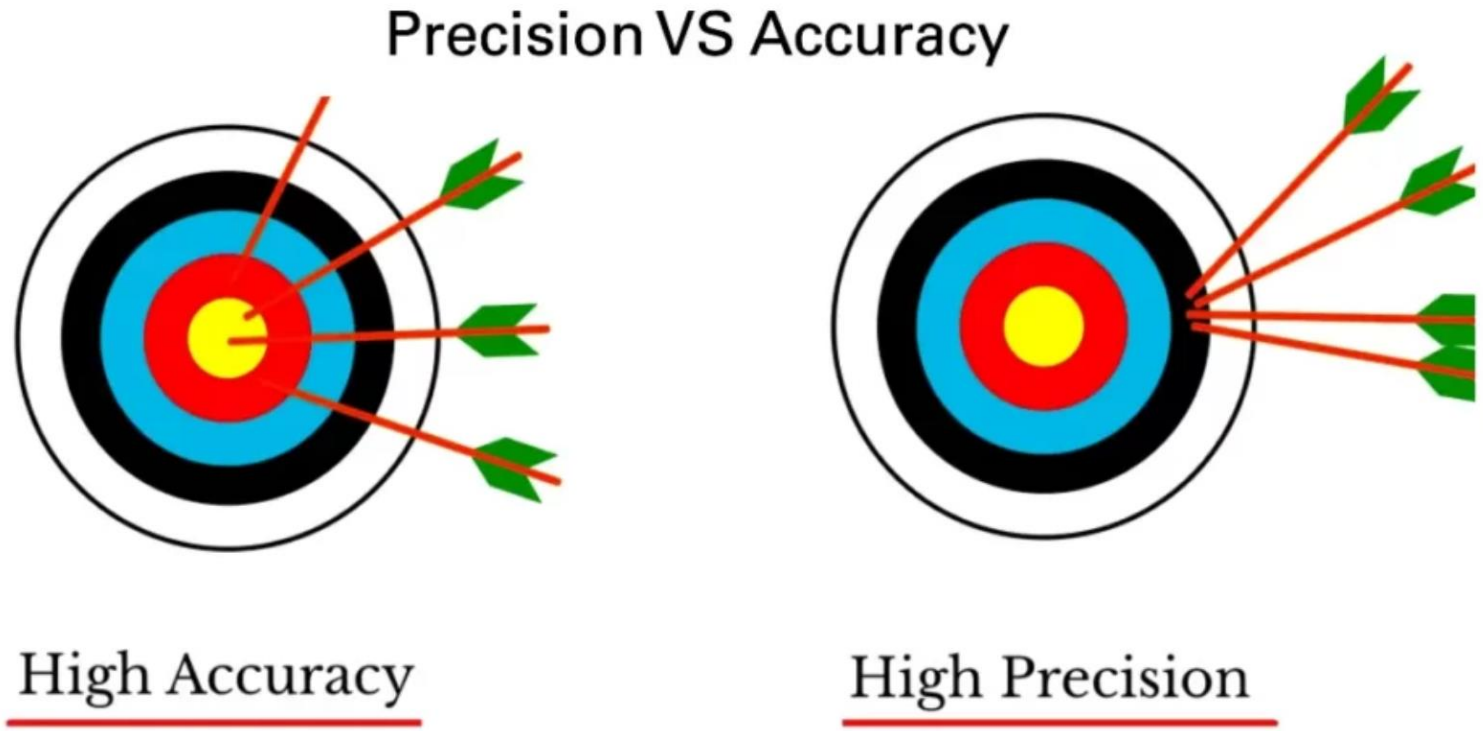
If the problem is a classification task	Check if the target variable consists of categorical labels or classes

Classification- Evaluation Metrics

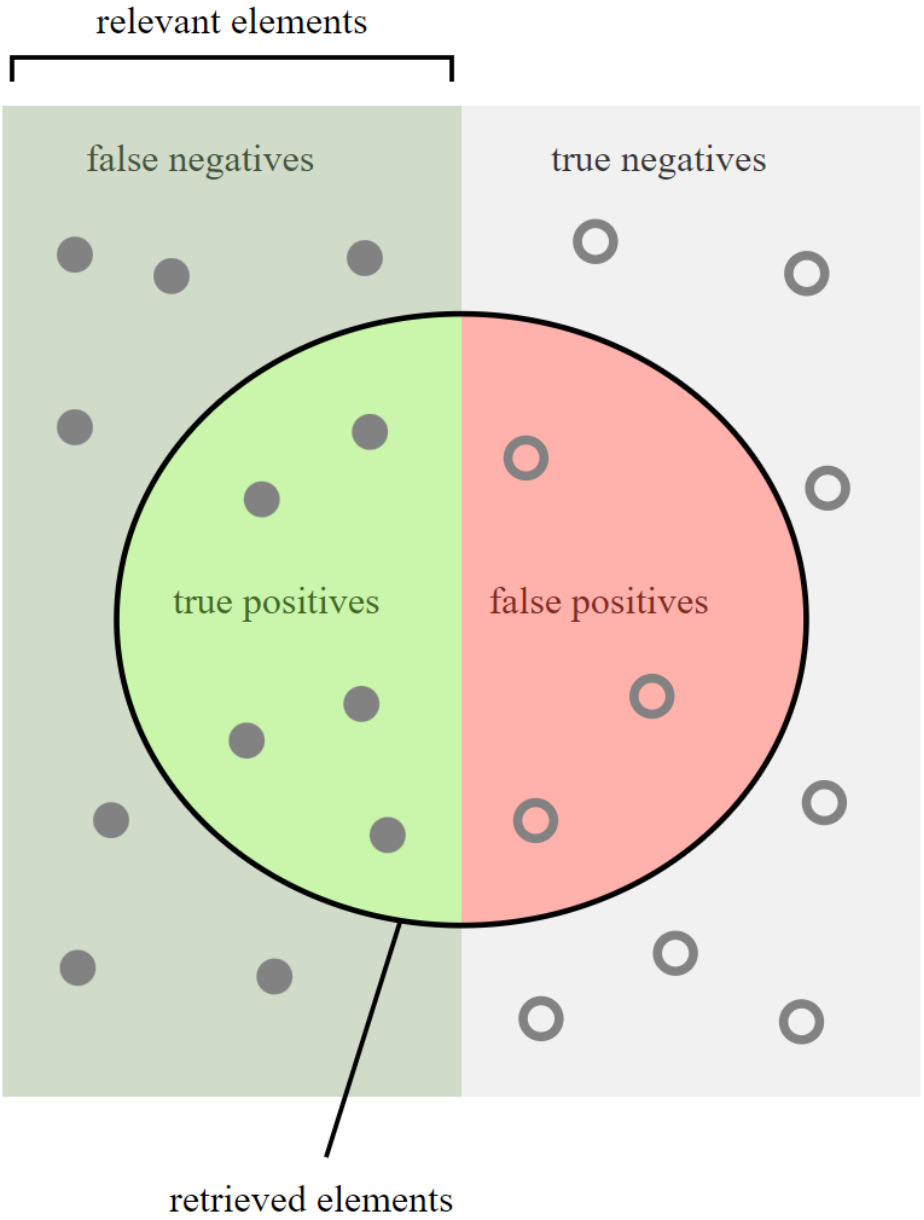
Evaluation Metrics

- Accuracy
- Precision, Recall, and F1-score
- Area Under the Receiver Operating Characteristic (ROC-AUC) curve
- Confusion Matrix

Accuracy and Precision



Recall



How many retrieved items are relevant?

$$\text{Precision} = \frac{\text{true positives}}{\text{retrieved elements}}$$

How many relevant items are retrieved?

$$\text{Recall} = \frac{\text{true positives}}{\text{relevant elements}}$$

F1 Score

F1 score Formula

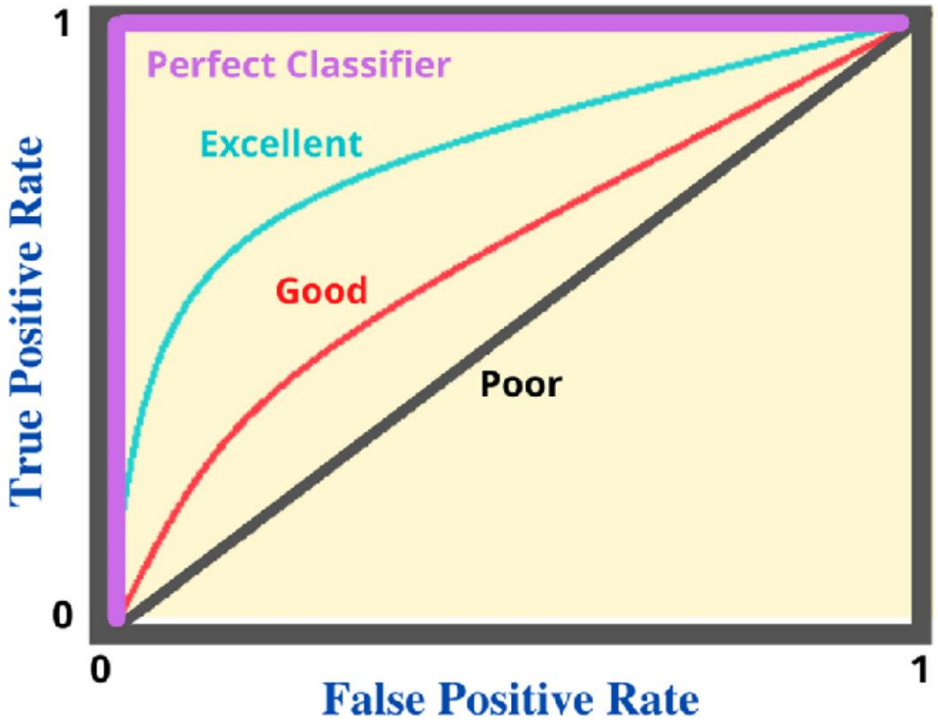
$$F1\ score = \frac{2}{\frac{1}{Precision}+\frac{1}{Recall}} = 2 \cdot \frac{Precision * Recall}{Precision + Recall}$$

$$\Rightarrow F1\ score = 2 \cdot \frac{Precision * Recall}{Precision + Recall}$$

1.The value of the F1 score ranges from 0 to 1.

1. 0: Worst Case
2. 1: Best Case

Area Under the Receiver Operating Characteristic (ROC-AUC) curve



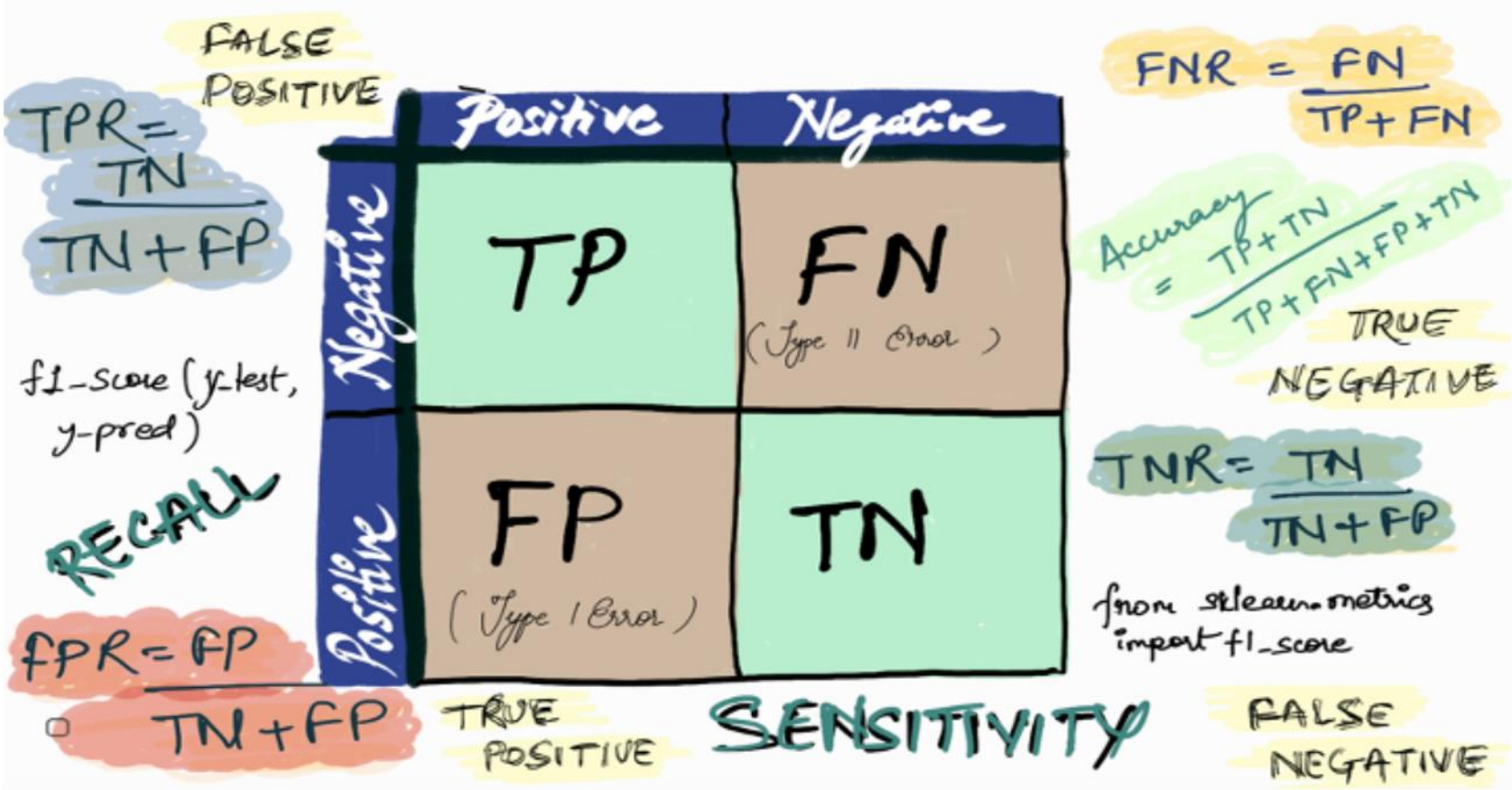
Acquired Class	True Class T	True Class F
Y	True Positives (TP)	False Positives (FP)
N	False Negatives (FN)	True Negatives (TN)

$$\text{True Positive Rate (TPR)} = \frac{TP}{TP + FN}$$

$$\text{False Positive Rate (FPR)} = \frac{FP}{FP + TN}$$

$$\text{Accuracy (ACC)} = \frac{TP + TN}{TP + FP + TN + FN}$$

Confusion Matrix



What is next?

Regression

Involve	Examples	To determine
Predicting	House price prediction	If the problem is a regression task
Continuous numerical	Stock price forecasting	Check if the target variable consists of continuous numerical values
Values or quantities.	Demand forecasting.	

Master in Artificial Intelligence

Algorithm Selection & Development II